

REMARKS

Claims 1-20 are pending in the subject application.

Applicants have amended claims 1-9 to more particularly point out and distinctly claim the subject matter of the invention. Applicants have added claims 10-20 to clarify the subject matter of the invention as contained in claims 1-9 as originally filed. Support for the claim amendments can be found in the specification as originally filed, particularly, support for the amendments to claims 1-9 are self-explanatory as to improve the language and correct grammatical errors; support for claims 10-13, 15, and 17-20 can be found at the paragraph beginning at page 3, last 2 lines from the bottom, in the specification as originally filed; support for claim 14 can be found at the paragraph beginning at page 4, line 7, in the specification as originally filed; support for claim 16 can be found at page 4, lines 12-21, in the specification as originally filed. No new matter has been introduced.

Applicants will submit the Change of Address, Revocation of Previous Power of Attorney, and new Power of Attorney shortly. Updated correspondence address for the subject application is indicated below.

Applicants request favorable reconsideration of the subject application in view of the amendments and the following remarks.

Claim Rejection Under 35 U.S.C. 112, Second Paragraph

The Examiner's Action rejected claims 1-9 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In response, Applicants have amended claims 1-9 to more particularly point out and

distinctly claim the subject matter of the invention. Accordingly, Applicants believe that the rejection has been overcome.

Claim Rejection Under 35 U.S.C. 103(a)

The Examiner's Action rejected claims 1-9 under 35 U.S.C. §103(a) as being unpatentable over CN 1,240,763.

In response, Applicants submit that the present invention as set forth in claims 1-20, as amendment, are patentable over CN 1,240,763 (CN'763).

First, the present invention as set forth in the amended claims 1-14 is patentable over CN'763. CN'763 discloses a method for producing sodium chromate and sodium bichromate by reacting chromium ore, caustic soda in the presence of pure oxygen at a temperature of 500-600°C. As indicated in Figure 1, claims 1 and 2, and detailed descriptions from the last line at page 1 to page 3, line 16, the chromite ore are mixed with caustic soda in a molten salt state, and oxygen is blown to the mixture in the molten salt state for reaction (Step 2). Then, the mixture is diluted with water and further processed (Step 3 and afterwards).

As disclosed at page 3, second paragraph, "because the present invention only uses chromite ore and caustic soda as the raw materials, and the pure oxygen as the oxidant, the chromite ore in the molten state quickly absorbs the blown-in oxygen to have a strong oxidation reaction, thus, overcomes the bias that pure oxygen can not directly be blown into the high-temperature molten state chromite ore and increases the rate of oxidation so that the time for oxidation is improved to 1-2 hours instead of 2-3 hours; in addition, eliminates carbon dioxide in the air which enters the high-temperature molten chromite ore to form carbonate (Na_2CO_3) to cause the increase of the molten temperature and decrease of the flowability . . . ; in addition,

avoids the addition of solid oxidant (such as sodium nitrate, potassium nitrate, etc., nitrates), to decrease the quality of the product..." As disclosed at page 4, lines 1-4, "because the raw materials only have chromite ore and caustic soda, having no additional material, thus, the chromium content for producing 1 ton of sodium bichromate is only 27.3% of that produced by the old technique, the chromium content for producing 1 ton of sodium chromate is only 17.45% of that produced by the old technique, basically solving the problem of chromium contents in the waste." As disclosed in CN'763, one of ordinary skill in the art would understand the scope of the patent would be limited to the use of only chromite ore and caustic soda as the starting materials, the pure oxygen as the oxidant, and the molten status at high temperature for the oxidation reaction. CN'763 teaches away from using any additional raw materials, or any other starting materials than chromite ore and caustic soda in the molten state. CN'763 repeatedly emphasized the use of only chromite ore and caustic soda as the starting material which renders the benefit of the disclosed process. CN'763 also teaches away from using any solid oxidant or air, because they bring impurities to the products and decrees the quality of the product. Any one of ordinary skill in the art would not use starting materials other than chromite ore and caustic soda and pure oxygen as oxidant to blow into the starting material in the molten state, if only taught by CN'763.

In contrast, the present invention as set forth in claim 1 is directed to a method for producing chromate comprising a step of decomposing a chromite ore by reacting the chromite ore with an oxidant in an aqueous solution of an alkali metal hydroxide at 200 to 500°C to produce a mixture containing the alkali metal hydroxide, an alkali metal chromate, and ferrous residue, leaching the mixture with an aqueous solution of the alkali metal hydroxide having a concentration of up to about 30 wt% to obtain a leaching slurry, and separating and obtaining primary alkali metal chromate, ferrous residue, and alkali liquor from the leaching slurry. The

claimed invention discloses the use of the aqueous solution of an alkali metal hydroxide to decompose chromite ore, which is neither taught nor suggested in CN'763.

The reaction temperature of 200 to 500°C is used in the decomposing mixture of the present invention, while in CN'763, the temperature is at 500 to 600°C, because the mixture of chromite ore and caustic soda so requires to reach the molten state. The claimed invention also discloses the use of the aqueous solution of the alkali metal hydroxide at a concentration of up to 30 wt% to leach, which is neither taught nor suggested in CN'763.

Any one of ordinary skill in the art, if only taught by CN'763, would not arrive at the claimed invention, because he/she would not use the starting material of an aqueous solution in the decomposition and leaching steps and the reaction temperature. Mere optimization of the reaction conditions as taught in CN'763 would not arrive at the present invention as claimed in claim 1. Therefore, the present invention as set forth in claim 1 is patentable over CN'763. Since claims 2-14 depend on claim 1, either directly or indirectly, they are also patentable over CN'763.

Should the Examiner decide that it is necessary to have a complete verified translation of CN'763, Applicants are willing to submit the verified translation of the complete Chinese language document.

Second, the present invention as set forth in the added claims 15-20 is patentable over CN'763. The present invention as set forth in claim 15 is directed to a method for producing chromate comprising the steps of decomposing a chromite ore by reacting the chromite ore with an oxidant in a molten salt of an alkali metal hydroxide to produce a mixture containing the alkali metal hydroxide, an alkali metal chromate, and ferrous residue, leaching the mixture with an aqueous solution of the alkali metal hydroxide to obtain a leaching slurry, and separating and obtaining primary alkali metal chromate, ferrous residue, and alkali liquor from the leaching slurry, wherein the oxidant is sodium nitrate, potassium nitrite, sodium peroxide, potassium peroxide, or a mixture thereof.

As discussed, *supra*, CN'763 teaches away from the use of any solid oxidant including

sodium nitrate, potassium nitrite and other nitrates. Therefore, any one of ordinary skill in the art, if only taught by CN'763, would not arrive at the claimed invention, because he/she would not use the solid oxidant in the decomposition step. In addition, he/she would not use an aqueous solution of alkali metal hydroxide having a concentration of up to 30 wt% for leaching. Mere optimization of the reaction conditions as taught in CN'763 would not arrive at the present invention as claimed in claim 15. Therefore, the present invention as set forth in claim 15 is patentable over CN'763. Since claims 16-20 depend on claim 15, they are also patentable over CN'763.

Therefore, there is no *prima facie* case of obviousness in view of CN'763. Moreover, the method for producing chromate as claimed in the subject application shows unexpected results of high recovery and high yields. As indicated in the specification, at page 3, first full paragraph, page 5, line 10 to page 6, line 6, and examples 1-12, all of the examples using the process of the present invention show a conversion rate of chromium at higher than 99%, the chromium content of the ferrous residue at lower than 0.5%, and the purity of the chromate crystal above 99.7%. Such an unexpected result would rebut any obviousness of the present invention over the cited prior art. Accordingly, Applicants believe that the rejection has been overcome.

Claim Rejection Under 35 U.S.C. 103(a)

The Examiner's Action rejected claims 1-9 under 35 U.S.C. §103(a) as being unpatentable over CN 1,226,512 (CN'512) in view of CN'763.

In response, Applicants submit that the present invention as set forth in claims 1-20, as amendment, are patentable over CN'512 in view of CN'763.

First, the present invention as set forth in claims 1-20, as amendment, are patentable over CN'512 in view of CN'763.

CN'512 discloses that chromites are oxidatively decomposed with air in the NaOH molten salt liquid flow medium at 500-550°C. The product is leached with water or chromium residue washing solution to get Cr^{6+} leaching solution with high concentration. The leaching temperature is 90-150°C, and the concentration of NaOH is 450-850g/l. Contrary to the Examiner's assertion, at page 5, paragraph 1, of the English translation of CN'512, the patent discloses the criticality of having concentrated NaOH solution for leaching at 500-900g/l: "[i]t is discovered in the invention that during the leaching of chromate in concentrated NaOH solution (NaOH 500-900g/l), sodium chromate can be directly crystallized upon cooling due to different solubility." Any one of ordinary skill in the art, if only taught by CN'512, would not use a NaOH solution at a concentration lower than the disclosed ranges in CN'512. In contrast, the present invention uses an aqueous solution of alkali metal hydroxide at a concentration of 0-30 wt% which is lower than the critical range as taught in CN'512. Moreover, the teaching away from CN'512 can not be cured by the combination with CN'763, because CN'763 does not even use an aqueous solution of alkali metal hydroxide for leaching.

In addition, CN'512 uses air for oxidation, while CN'763 uses pure oxygen for oxidation. As discussed, *supra*, there is no motivation to combine the processes as taught in CN'763 and CN'512, because CN'763 expressly disavowed the use of air in the decomposition step.

As admitted in the Examiner's Action on page 4, paragraph 5, and clearly illustrated in Figure 1 of CN'763, the steps for making chromate as taught in CN'763 are fundamentally different from that of CN'512 and the present invention. One of ordinary skill in the art, when taught by CN'512, would not optimize the reaction conditions to arrive at the process as disclosed in the claimed invention, and would not have a motivation to even combine the teachings of CN'512 and CN'763. Even if CN'512 and CN'763 are combined, they still neither

disclose nor suggest the claimed invention in both decomposition and leaching steps.

Therefore, there is no *prima facie* case of obviousness. Moreover, the method for producing chromate as claimed in the subject application shows unexpected results of high recovery and purity. As indicated in the specification, at page 3, first full paragraph, page 5, line 10 to page 6, line 6, and examples 1-12, all of the examples using the process of the present invention show a conversion rate of chromium at higher than 99%, the chromium content of the ferrous residue at lower than 0.5%, and the purity of the chromate crystal above 99.7%. Such an unexpected result would rebut any obviousness of the present invention over the prior art. Accordingly, Applicants believe that the rejection has been overcome.

In view of the foregoing, Applicants believe that all rejections have been overcome and claims 1-20, as amended, are in condition for allowance, early notice of which is requested.

A Petition for Extension of Time and Fee of \$225 accompany this response. Should any other fee be required, please charge same to Deposit Account No. 50-2586 and notify Applicants' attorney.

Respectfully submitted,
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